Seven Common Diseases *of* Landscape Trees

Pennsylvania's community forests are among our greatest natural assets. Trees in our neighborhoods and towns help keep us healthy, grace us with their elegance and beauty, and provide us with clean water and air. Those who manage and care for trees in Pennsylvania communities know how important it is to protect them from man-made and natural threats such as soil compaction, pests, and diseases.

This publication addresses disease prevention among Pennsylvania landscape trees. Seven of the most troublesome diseases that can cause problems with trees in Pennsylvania are:

- Dutch elm disease
- oak wilt
- anthracnose
- maple decline
- verticillium wilt
- fire blight
- root and butt rots

Trees affected by these diseases detract from the appearance of landscapes, decline in health, pose threats to safety, and ultimately die and must be removed. Managing diseased trees also can cause conflicts in communities between people who desire the benefits of trees and those who must remove them to protect the safety of citizens and the health of the community forest.

The best way to avoid disease, conflict, and safety hazards is to plant trees that are most likely to remain healthy under the conditions of a planting site. After you've matched the correct tree characteristics with the planting site, providing good care and maintenance by a qualified arborist and protecting trees from construction and other damage are important.

Early detection of tree diseases also is important, especially in ornamental plants, where small amounts of damage can have serious effects on tree beauty. Because timing is important both in limiting damage to infected trees and in treating the diseases, looking for or "scouting" for tree diseases is critical. Publications such as *Scouting and Controlling Woody Ornamental Diseases in Landscapes and Nurseries* (see "For More Information" on page 7) explain when to scout for important diseases, what to look for, and where to look. Fungus diseases in trees are particularly difficult to treat, so the longer it takes to identify a disease and take remedial action, the harder it will become to control the disease successfully.

This booklet will help you to identify symptoms of seven of the most common landscape tree diseases in Pennsylvania. The following sections include photographs and descriptions of each disease, as well as methods of diagnosis and recommendations for treatment.

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Dutch Elm Disease

Over the past 40 years, Dutch elm disease has killed thousands of elm trees within community forests. The disease is thought to have been brought from Europe on diseased elm logs in the 1920s. The fungus that causes the disease, *Ophiostoma ulmi*, usually is carried to healthy elms by native and European elm bark beetles, but also is spread from tree to tree through root grafts among elms growing in groups. The first sign of infection appears when leaves on one or two branches "flag" (become wilted and yellow). The disease spreads rapidly to other branches and will kill a tree in two to three years. Death occurs because the fungus clogs the xylem, or water-moving system, of the tree.

As soon as a tree is diagnosed with Dutch elm disease, it should be removed promptly so that it does not become a source of beetles that can spread the fungus. To stop the spread of the disease by beetles, all wood greater than 1/2 inch in diameter, as well as the stumps of removed trees, must be debarked, buried, or burned. If the bark is left on the wood untouched, beetles and the fungus will continue to develop. In groups of elms, it is important to trench to a depth of two feet around infected trees to cut root grafts that may have formed with other elms growing within 50 feet of them.

Decreasing the population of elm beetles also can greatly slow the progress of Dutch elm disease. In addition to removing and disposing of all elms infected with the disease, spray elms with an insecticide during the spring when the beetles are expected to emerge during the spring and summer. Monitor beetle populations using sticky pheromone traps, which contain a hormonal substance that is attractive to beetles in flight. Do not hang these traps in or near elms; instead, place them on a telephone pole or in another species of tree.

The beetle population also can be suppressed by trapping insects in infected trees before those trees are removed. Infected trees can be injected with the chemical herbicide cacodylic acid. Beetles are attracted to these dying trees and lay their eggs there. The treatment prevents the young beetles from maturing, and they are unable to leave the treated trees.

The first sign of Dutch elm disease is the wilting and yellowing of one or two branches (above and facing page, top).

Removing deadwood and preventing soil compaction from pedestrian and other traffic are good preventive measures for Dutch elm disease.

Frequent pruning can reduce beetles' attraction to a tree by removing dying branches where beetles feed, lay their eggs, and mature. Do not prune elm trees in the late spring or summer, because fresh pruning wounds attract fungus-carrying beetles. Instead, prune elms in the winter, from the beginning of November through March.

In some cases, elms can be saved if the disease is diagnosed before more than five percent of the crown has been affected. Successful treatment requires first pruning the infected branches and then injecting either Alamo or Arbortect fungicide into the xylem around the base of a tree's trunk. Branches must be pruned about 10 feet below the point of infection. In addition, some specialists suggest removing bark and visually identifying and removing infected, brown-stained wood from the trunk and large limbs below flagging branches.

The most cost-effective, long-range strategy for avoiding Dutch elm disease is to plant disease-resistant elm varieties. Promising cultivars of American elm that have the highest resistance to Dutch elm disease are Princeton, New Harmony, and Valley Forge. Although laboratory tests of these cultivars are promising, concern still exists about their performance in urban situations. For example, some resistant varieties are very susceptible to elm leaf beetle feeding. Until they have been tested more widely and for longer periods of time, only small numbers of these trees should be planted in any one area.

Oak Wilt

Oak wilt is a rapid killer of red oak trees. As with Dutch elm disease, a fungus that clogs the xylem, or water-moving system of a tree, causes oak wilt. In two to three weeks, a once-healthy red oak can begin to shed a tremendous number of dull green leaves. This disease symptom usually occurs in late spring or summer. Because the fungus does not occur in all parts of an infected tree, oak wilt can be difficult to diagnose. When taking wood samples with an increment borer to diagnose the disease, sample from a number of places along the trunk.

Scientists have not identified all of the insects that may spread the oak wilt fungus. It is known, however, that sap-feeding beetles are important carriers, and that they can carry the fungus only short distances. The fungus is moved long distances when it and beetles are transported within firewood. Like Dutch elm disease, the oak wilt fungus also spreads from tree to tree through root grafts among neighboring red oak trees. Trees that have been exposed to the disease because of their proximity to infected trees have been successfully protected by injecting Alamo fungicide into the xylem around the base of the trunk and by trenching to cut root grafts. Trees that have been diagnosed with the disease should be removed immediately and burned or buried. Because fresh pruning wounds are attractive to the insects that carry the fungus, do not prune red oaks in the late spring or early summer whenever oak wilt is a concern. Prune red oaks in the winter, from the beginning of November through March.

Red oaks infected with oak wilt shed tremendous numbers of dull green leaves very quickly.

Anthracnose

Although not as serious as Dutch elm disease or oak wilt, anthracnose is another disease that can greatly detract from the appearance of a tree. Several fungi cause anthracnose in various tree species. Some are specific to a particular host species, while others can attack several species. In most cases, such as anthracnose of sycamore, black walnut, ash, oak, and maple, the trees are not killed; however, the anthracnose of native dogwood trees does kill infected trees if attacks occur for several consecutive years. In most other cases, the disease kills only a tree's fine twigs and buds and causes it to drop many leaves in the spring and summer. A vigorous tree such as sycamore will set new buds and grow new leaves later in the summer after the weather dries out and the fungus is not as active. Anthracnose may be limited in the next growing season by cool, dry weather during the time of bud break.

If a particular tree is of very high value, it can be treated by spraying with a fungicide in the spring as the buds open. Fungicide applications must be repeated during wet and humid periods when tender new buds and twigs are growing. Some cultivars of trees are resistant to

Injections of alamo fungicide can help protect red oak trees that are close to infected trees.

Death of a leaf from anthracnose

anthracnose. For example, the vegetatively propagated Bloodgood, Columbia, and Liberty clones of the London plane tree are resistant to sycamore anthracnose. Some hybrids of kousa and native dogwoods have good resistance to the branch dieback phase of anthracnose. The cultivars Celestial, Milky Way, and Stellar Pink are highly resistant to anthracnose and also to powdery mildew.

Gradual decline and death of sugar maple caused by maple decline

Maple Decline

The gradual declining health and death of sugar maples results from combinations of biological and environmental factors. Maple trees growing in parking lots and next to roads and sidewalks often are exposed to high temperatures, poor and compacted soils, drought, road salt, girdling roots, and severe restriction of root development. Any of these factors can contribute to decline problems. Trees affected with decline often show early fall coloration and major branch dieback. Eventually, this gradual killer causes increasing numbers of branches and finally the entire tree to die. The whole process of decline and death takes several years.

The only effective approach to solving this problem is to avoid planting sugar maples in areas where they will be exposed to harsh conditions such as road salt, compacted soils, and high temperatures. Remove affected trees and replant with species such as honey locust or zelkova that are better adapted to tolerate these conditions.

Verticillium Wilt

Verticillium wilt causes some of the same symptoms as maple decline and is a common vascular disease in community forests. Verticillium wilt causes serious problems not only for maples, but also for redbud, catalpa, goldenrain trees, and other trees planted along streets, sidewalks, or parking lots. The Verticillium fungus resides in the soil and moves into the xylem of a tree through wounds in the roots and lower trunk. To protect trees, avoid creating such wounds with lawnmowers, rotary weed trimmers, or excavating equipment.

Late summer is the best time to examine maples and other trees for symptoms of the disease. Symptoms may develop first on just one branch or on a few branches on one side of the tree. The leaves of the affected part wilt, dry, and fall. In trees infected by Verticillium, the xylem just under the bark has black streaks that are usually visible only in branches one inch in diameter or larger.

The disease is not easily controlled. Promoting the vigor of an infected tree

The xylem of trees infected with verticillium wilt has black streaks that are usually visible in larger branches.

Death of leaves caused by fire blight

may prolong its life. Watering during extended dry periods and pruning all deadwood is recommended. Infected trees should not be heavily fertilized, because this predisposes the tree to further disease development. Verticillium survives for many years in soil, so maples and other susceptible trees should not be planted in areas where trees have been affected by the disease. Although many deciduous trees are susceptible to this fungus, yews and conifers, mountain-ash, birch, honeylocust, sweetgum, crabapple, dogwood, sycamore, ginkgo, beech, white and bur oaks, pear, and larch are considered resistant. To avoid problems with Verticillium wilt, plant only resistant species in areas from which diseased trees have been removed.

Fire Blight

Fire blight is caused by a bacterium. The disease occurs wherever susceptible trees grow in the United States and Canada, but it is more serious in warmer climates. It affects only members of the rose family, including crabapples, apples, mountain-ash, hawthorn, and ornamental pears; however, some cultivars of these trees have good levels of resistance to the disease. Resistant cultivars of crabapples include Centurion, Harvest Gold, Prairifire, and Robinson. Resistant varieties of pear include Cleveland Select and Whitehouse.

Fire blight can cause both disfigurement and death of infected trees. Principal symptoms include death of blossoms, fruitlets, and shoots; and formation of cankers that cause dieback in twigs and larger branches. The young flowers, leaves, and twigs of infected trees suddenly wilt and turn brown to black. Dead leaves hang down and cling to blighted twigs. The first symptom of the disease is usually the death of flowers, because infection often occurs through the nectaries. Another prominent symptom is the death and browning of new shoots. If many shoots are infected at once, a tree appears to have been scorched by fire; thus the name “fire blight.” The disease also can cause cankers, which are slightly sunken, brown to black areas on twigs, branches, and trunks. Cankers positioned on the main trunk or root collar may kill an entire tree.

A fungal fruiting body or conk is a sign of root and butt rots.

The bacteria are most commonly spread by splashing and dripping water, bees and other flower-visiting insects, and pruning tools. The disease can be delayed or halted by careful pruning of all diseased shoots, twigs, and branches. Pruning cuts should be made in sound wood at least 12 inches below dieback or cankers. Pruning should be done during dry, cold weather, and pruning tools must be disinfected between cuts using a bleach solution or commercial disinfectant. Avoid nitrogen fertilization of the tree, because new growth can promote disease development. Cool, dry weather during the time of blossoming may lessen problems with fire blight in the upcoming growing season.

Root and Butt Rots

Several root and butt rots are troublesome in Pennsylvania. *Armillaria*, or shoestring fungus, *Fomes fomentarius* (Fomes root rot), *Ganoderma lucidum* (Ganoderma root and butt rot), and *Inonotus dryadeus* (weeping conk fungus) are common parasitic or wood-decaying fungi. They attack a wide variety of hosts, and in many cases trees become hazardous because the root and butt rots greatly weaken their structure. The canopy of an affected tree often looks healthy, but the unseen rot in its roots and butt can render it susceptible to wind throw or just falling.

In Pennsylvania, weeping conk is an example of a common fungus that can become a problem in street, park, and ornamental trees. The fungus is widespread in oaks in the eastern and southern United States, and in conifers such as hemlock and spruce in the west. The disease is most common in older or suppressed trees growing on poor soils or those that have been damaged by compaction, construction, or other impacts. As with other root rots, infected trees show no aboveground symptoms at first, but eventually show signs of decline including sparse foliage, poor color, and crown dieback. Oaks with many infected roots may suddenly die during periods of heat and drought.

The fungus begins unseen well out in the root system, then spreads and eventually reaches the butt of infected trees. There is no evidence that it spreads from tree to tree through root grafts. Fruiting bodies of the fungus, called conks, arise annually on infected trees from exposed roots or from the trunk near ground level. The tops and sides of conks are initially yellow to yellow-brown and turn brown to chestnut-brown at maturity. After several months, they become blackish with a rough skin. The exteriors of conks are reddish-brown, and the undersides are brown. Millions of fungal spores are formed on the underside of a conk.

To limit the fungus, protect soils and trees from compaction, root damage, construction, and other damage. Infected trees may topple before any sign or symptom becomes obvious. The presence of a fruiting body or conk is a sure sign of the disease. Remove infected trees immediately.

For More Information

Lloyd, J. 1997. *Plant Health Care For Woody Ornamentals.* International Society of Arboriculture, P. O. Box GG, Savoy, IL 61874-9902. (217) 355-9681. (A professional's guide to preventing and managing environmental stresses and pests. Published in partnership with the Cooperative Extension Service, College of Agricultural, Consumer, and Environmental Sciences, University of Illinois at Urbana-Champaign.)

Moorman, G. D. 1994. *Diseases of Flowers, Foliage, and Woody Plants.* Department of Plant Pathology, The Pennsylvania State University, 111 Buckhout Laboratory, University Park, PA 16802-4506. (814) 863-7401. (A listing of common diseases and management strategies for plants frequently grown in greenhouses, interiorscapes, and outdoor landscapes and nurseries in the northeastern U.S.)

Moorman, G. D. 1997. *Scouting and Controlling Woody Ornamental Diseases in Landscapes and Nurseries.* Penn State College of Agricultural Sciences Cooperative Extension, 112 Agricultural Administration Building, University Park, PA 16802-2602. (814) 865-6713. (Describes when to scout for plant disease, what to look for, and how to look.)

Sinclair, W. A., Lyon, H. H., and Johnson, W. T. 1987. *Diseases of Trees and Shrubs.* Cornell University Press, 124 Roberts Place, Ithaca, NY 14850. (A nationally recognized desktop reference for common diseases of plants.)

PREPARED BY Bill Elmendorf, instructor of urban and community forestry; Gary Moorman, professor of plant pathology; and Henry Gerhold, professor of forest genetics

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